INTRODUCTION
Frequency converter cooling ribs are in the air flow. Surplus heat is removed by active ventilation.

This frequency converter is used with permanent magnet synchronous motors (PM) or asynchronous motors (AC).

Speed can be controlled with a 0-10 V DC signal, potentiometer, Modbus RTU or hand terminal. The hand terminal (STRZ-45) is not automatically included in the delivery but can be ordered as an accessory. Main voltage requirement is 3-phase 400 V AC. Frequency controller is equipped with an EMC filter.

Built-on means that the frequency converter is mounted to the side of the fan. If the fan service side is on the other side, the drive can easily be moved there by opening four screws. Cabling between motor and drive is already done.

Built-on version is ready to be used and needs only power from mains and control signals. They can be easily connected to the terminals under the drive’s plastic cover.

FEATURES
As standard, frequency converter has the following built-in features

- Modbus RTU
- 0-10 V analogue input for controlling speed
- Control via external hand terminal
- Indication relays for alarm and running
- Flying start
- Alarms for overload, over-voltage and under-voltage
- Motor and cable protector with built-in current limiter
- Short-circuit protection against phase to phase short circuiting on motor output terminals
- Digital input for “Start/stop”
- Digital input for “Alarm reset” or “Fire mode”
- Built-in EMC filter
- Automatic speed reduction in the event of over temperature inside the drive or lacking phase on the supply input
FLÄKTGROUP BUILT-ON FREQUENCY CONVERTER

INSTALLATION

Electrical installation
- Frequency converter must only be installed and commissioned by trained and qualified personnel.
- Incorrect electrical installation may cause risk of severe or fatal personal injury.
- If natural draught through the duct system causes the fan to rotate even when it has not received an operating signal, there is a risk that the motor will induce voltage on the frequency converter motor terminals, making them dangerous to touch.

Short circuit protection
- Correct short-circuit protection must always be used with the frequency converter in accordance with local and international regulations.
- Short-circuit protection is supplied by the installer.

Supplementary protection
- Direct grounding or TN or TT system grounding can be used for supplementary protection.
- Frequency converter must always be supplementary protected with a grounding wire connected to the protective earth terminal (PE).
- If an RCD/HPFI (TT system) is used, it must be specifically intended for use with motor controllers.

Potential equalisation
- There is a risk of electrical interference if the ground potential between the frequency converter and the air handling unit or duct differ from each other. In the event of potential differences between system components, an equalisation conductor must always be fitted.
- Recommended cable cross section is 10 mm².
- Lugs should be used, and the equalisation conductor should be attached to the frequency converter enclosure via one of the screws used to mechanically install the unit.

Ground connection (PE)
- Frequency converter must be grounded in accordance with applicable local and international standards and directives.
- In power cable, please use a grounding lead which is suitable for the purpose.
- Frequency converter must be grounded singly and must therefore never be grounded in series.
- Keep ground connection wires as short as possible.

Cable requirements
- All cables and leads used in connection with the frequency converter must comply with local and national rules and regulations.
- Shielded cable is not necessary for I/O or Modbus communication, but Modbus needs to be twisted pairs.
- Generally, cable types with copper wires are recommended.
- For recommended cable dimensions, see table 3.1.

Opening the frequency converter
- Check that the voltage supply to the frequency converter has been disconnected before opening the cover.
- NOTE: Wait approx. 3 minutes after disconnecting mains voltage before removing the cover.
- Frequency converter is opened by loosening the six Torx20 screws holding the plastic cover in place.
- Carefully remove the loosened cover.
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<table>
<thead>
<tr>
<th>Power supply cable</th>
<th>Power</th>
<th>Cable gland</th>
<th>Cable diameter</th>
<th>Cable size, min.</th>
<th>Cable size, max.</th>
<th>Core sleeve/stripped min.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1,5-3,0 kW</td>
<td>M20</td>
<td>7-13 mm</td>
<td>4x1,5 mm²</td>
<td>4x2,5 mm²</td>
<td>10 mm</td>
</tr>
<tr>
<td></td>
<td>4,0-7,5 kW</td>
<td>M20</td>
<td>7-13 mm</td>
<td>4x1,5 mm²</td>
<td>4x4 mm²</td>
<td>15-10 mm</td>
</tr>
<tr>
<td></td>
<td>11, 15 kW</td>
<td>M25</td>
<td>10-17 mm</td>
<td>4x1,5 mm²</td>
<td>4x10 mm²</td>
<td>18-10 mm</td>
</tr>
</tbody>
</table>

| A/D control cable | 1,5-15 kW | M20 | 7-13 mm | 2x2x0,7 mm² | 10x2x0,7 mm² | 10 mm |

| Modbus round cable | 1,5-15 kW | M16 | 4-10 mm | 3x2x0,7 mm² | 10x2x0,7 mm² | 10 mm |

| Modbus ribbon cable | 1,5-15 kW | Telecommunication cable/ribbon cable, 6-core, unshielded, 30 AWG/0,066 mm² |

TERMINALS AND CONNECTIONS 1,5-3,3 KW

TERMINALS AND CONNECTIONS 4,0-7,5 KW
FLÄKTGROUP BUILT-ON FREQUENCY CONVERTER

SUPPLY VOLTAGE CONNECTION 3–400V, 50HZ
• Connect power cable to terminals L1, L2, L3 and PE
• It is recommended that the PE wire is 20 mm longer than the other wires in the cable
• Remember to re-tighten the cable glands to ensure ingress protection and strain relief.

MODBUS CONNECTIONS
Frequency converter is equipped with four connectors for Modbus communication:
1 x connector on terminals labeled “Bus A”, “Bus B” and GND on the strip with spring terminals (to be used when in Modbus).
• 3 x RJ12 connectors marked “A”, “B” and “C”:
  • “A”: Modbus connection, slave, +24V voltage supply in connector.
  • “B”: Modbus connection, slave, no voltage supply in connector.
  • “C”: Modbus connection, master, external equipment, e.g. PTH/VOC.

A/D CONTROL SIGNAL CONNECTIONS
• Connect A/D control signals to the terminal strips.
• The function/programming of A/D inputs and outputs can be changed via Modbus.

Potentiometer control
• +10Vdc = +10VDC output, max. 20mA.
• 0-10V In = Analogue 0-10V control input for speed.
• Potentiometer, electrical connection.
(Potentiometer: min. 500Ω, recommended 4.7 kΩ)
• GND = Ground (-).

External controller, electrical connection
• 0-10V In = Analogue 0-10V (+).
• GND = Ground (-).
FLÄKTFORCE BUILT-ON FREQUENCY CONVERTER

Digital inputs
Din2 = Alarm reset (factory setting)
Din1 = Start/Stop (factory setting)

Digital output
Dout1 = Alarm Out; Open Collector (factory setting) GND= Ground (-)
• 10Vdc = 10VDC output, max ... mA.
• Pull-up resistance range= 1.5-22 kΩ
• Pull-up voltage range= 24 VDC,
• Pull-up current range= 0-20 mA

Relay outputs
Relay output 1: Alarm
• Relay 1 (terminals 11, 12, 13) can be used to send an alarm signal to an external device.
• The signal output is a changeover relay which is closed between terminals 11 and 12 in idle position or otherwise between terminals 12 and 13.
• If the frequency converter has stopped due to a critical alarm, the relay will switch position and close between terminals 12 and 13. The relay is simultaneously opened between terminals 11 and 12.
• When the alarm is reset / acknowledged, the relay returns to its original position, closing between terminals 11 and 12.

Relay output 2: Running indication
• Relay 2 (terminals 14, 15, 16) can be used to send an operating signal to an external device.
• The signal output is a changeover relay which is closed between terminals 14 and 15 in idle position and otherwise between terminals 15 and 16.
• When the frequency converter receives a start signal, the relay changes position, closing between terminals 15 and 16. The relay is simultaneously opened between terminals 14 and 15.
• When the start signal to frequency convert is removed, the relay returns to its starting position, closing between terminals 14 and 15.

FUNCTIONS
Frequency controller can be controlled via:
• Analogue/digital (A/D) inputs (factory setting)
• Modbus RTU
• Local hand terminal STRZ-45
• Potentiometer

Analogue/digital control
Frequency controller can be controlled by external input signals. Before the frequency converter can be started, it must be given a start/stop signal. It is given by short-circuiting terminals GND and Din1.
Speed is controlled by connecting the control signal (0-10V DC) to terminals 0-10V In and GND.
To better understand the relation between control signal (0-10 V In) and speed see figure.
The control signal regulates motor speed between the set minimum and maximum speeds and the set ramp times (NOTE: For AC motors, speed is in Hz; for PM motors, speed is in rpm).

Switching frequency (switching mode) is set via Modbus:
- Setting "4kHz" = Constant 4kHz switching frequency
- Setting "8kHz" = Constant 8kHz switching frequency
- Setting "AUTO" = Switching frequency is changed automatically:
  - At motor speeds higher than 70% of rated speed, switching frequency is changed to 4 kHz
  - At motor speeds lower than 60% of rated speed, switching frequency is changed to 8 kHz.

Fire mode
- Fire mode designates a function in which the frequency converter is kept operating by an emergency program which disables the alarm monitor.
- Among other things, the function can be used in connection with smoke extraction from a burning property. When fire mode is activated, an extraction fan will continue to remove smoke from the property for as long as possible.
- In fire mode, the frequency converter is able to maintain operation for at least an hour even when the frequency converter and the fan motor are overheated (max. 70 °C).
- In fire mode, the overheating protection built into the frequency converter is disabled and the motor is not stopped if communication is lost.
- In fire mode, the fan is not stopped in case of faults or other alarms from either the fan or the frequency converter.
- Speed is controlled to the actual setting, determined by an external 0-10V signal, a potentiometer or via Modbus from a Modbus master controller.
- Fire mode can be activated via Modbus.

BUILT-IN PROTECTION
- If the temperature inside frequency converter exceeds +95 °C, the frequency converter will attempt to reduce its internal heat generation by reducing motor speed (rpm).
- Frequency converter has built-in current limitation for the protection of motor and cables and cannot therefore supply more current than it is set to.
- In the event of lacking phase on the supply input, the frequency converter will reduce speed and activate a non-critical alarm.
- The frequency converter motor output terminals are short circuit protected against phase-to-phase short circuiting.
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ALARMS

- Frequency converter has a built-in alarm monitor, which monitors optimal fault-free operation and triggers an alarm if operating or performance problems are observed.
- Alarms are either “Critical” alarms or “Non-critical” alarms.
- “Critical” alarms stop the motor.
- “Non-critical” alarms reduce motor performance.
- The built-in alarm monitor stops the frequency converter.
- If the alarm situation passes, the alarm is automatically reset and frequency converter restart-ed.

- If the maximum number of restarts (5 times/60 min) is exceeded, the alarm must be reset manually.
- The alarm can be reset by means of a Modbus command.
- The alarm is automatically reset if the power is disconnected for longer than 60 seconds.
- Alarms can be read via Modbus (see Modbus manual 9931GB).

<table>
<thead>
<tr>
<th>Alarm overview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>Insufficient supply voltage</td>
</tr>
<tr>
<td>Excessive supply voltage</td>
</tr>
<tr>
<td>Excessive power consumption by motor</td>
</tr>
<tr>
<td>Excessive temperature inside FWD-02 (&gt; 95°C)</td>
</tr>
<tr>
<td>Phase fault; one or more phases disconnected (L1, L2, L3)</td>
</tr>
<tr>
<td>Blocked motor</td>
</tr>
<tr>
<td>Motor current has reached its limit</td>
</tr>
<tr>
<td>Internal hardware fault</td>
</tr>
<tr>
<td>Wrong direction of rotation</td>
</tr>
<tr>
<td>Fault in internal EEPROM circuit</td>
</tr>
<tr>
<td>Stopped after 5 attempted restarts within 60 min</td>
</tr>
<tr>
<td>Fault in braking chopper</td>
</tr>
<tr>
<td>Phase fault on motor power supply (U, V, W)</td>
</tr>
<tr>
<td>Internal communication error</td>
</tr>
<tr>
<td>Excessive ripple voltage</td>
</tr>
<tr>
<td>External 24VDC power supply overloaded</td>
</tr>
</tbody>
</table>

Abbreviations: C = Critical alarm, NC = Non-critical alarm, RP = Reduced performance, SA5 = Motor stops after 5 restarts caused by same fault within 60 min, S = Motor stops immediately

LED indications

- Frequency converter is equipped with a two colour LED which indicates operating status.
- The LED is located on the underside of the frequency converter beside the entry for the mains cable.
- LED lights constantly green when mains voltage is connected
- LED lights green when Modbus communication is active
- LED lights constantly red when at least one critical alarm is active
- LED flashes red when at least one non-critical alarm is active

![LED diagram]
FLÄKTGROUP BUILT-ON FREQUENCY CONVERTER

ADDITIONAL RESOURCES
Hand terminal (STRZ-45) connection and functions
The FläktGroup built-on frequency converter can be connected to a STRZ-45 hand terminal via Modbus RJ12 connector “A”. If a STRZ-45 is connected, the hand terminal will act as master and the frequency converter as slave.

Important!
Only one master at a time can be connected to the RJ12 connectors marked “A” and “B”. It is thus not possible to connect both a hand terminal to connector “A” and an active Modbus communication cable to connector “B” at the same time.

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TECHNICAL DATA
Supply voltage ....................................... 4 VDC from frequency converter
Modbus RTU ........................................................ 2 x RJ12/6/6-pole RS485
Enclosure rating......................................................... IP21
Air humidity ..................................................................... 10-95 % non-condensing
Storage temperature ................................................... –30..+50 °C
Operating temperature ............................................... 0..+40 °C
Dimensions...................................................................... 171 x 82 x 38.5 mm
Weight .................................................................................. 150 g

ALARMS
Current alarms are displayed as shown in following table. Alarms are automatically reset if the alarm situation passes and the frequency converter is restarted.

However, once the maximum number of restarts has been exceeded, the alarm must be reset by selecting “Reset Alarm” in the alarm menu. Alternatively, the “Alarm reset” input on the frequency converter can be short-circuited to earth (only if Control = 0-10 V) or the voltage supply to the frequency converter can be disconnected.

STRZ-45 has the following menu options:

- Status: Control and operating parameters for connected frequency converter
- Setup: Setting application parameters
- Alarm: Read-out of alarm log for connected frequency converter
- Modbus: Changing Modbus settings for frequency converter
- About: Read-out of software version no. and type for connected frequency converter
- Config: Changing frequency converter / motor settings
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See next table and accompanying notes for a further description on the menus and features of the STRZ-45.

<table>
<thead>
<tr>
<th>Main Menu</th>
<th>Settings</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Operation</td>
<td>Start/stop of motor</td>
<td>Stop/start</td>
</tr>
<tr>
<td></td>
<td>Set Setpoint</td>
<td>With frequency converters hand terminal set to &quot;Modbus***&quot; in the &quot;Start/Stop&quot; / &quot;Control&quot; menu, the required setpoint for EC can be set in %. With frequency converters hand terminal set to &quot;0-10 V DC&quot; in the &quot;Start/Stop&quot; / &quot;Control&quot; menu, the actual setpoint is displayed in %.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>% Out</td>
<td>Displays actual revolutions in per cent of range (fig. 7)</td>
<td>0 - 100 %</td>
</tr>
<tr>
<td></td>
<td>Rpm Out</td>
<td>Displays actual revolutions</td>
<td>PM: 0 - * rpm</td>
</tr>
<tr>
<td></td>
<td>Power</td>
<td>Displays actual input power</td>
<td>0 - * kW</td>
</tr>
<tr>
<td></td>
<td>Analogue_In 1</td>
<td>Displays actual voltage on external setting input.</td>
<td>0 - 10.0 V</td>
</tr>
<tr>
<td></td>
<td>Digital_In 1</td>
<td>Displays actual status</td>
<td>&quot;1&quot; = Active</td>
</tr>
<tr>
<td></td>
<td>Digital_In 2</td>
<td>Displays actual status of fire mode</td>
<td>&quot;1&quot; = Active</td>
</tr>
<tr>
<td></td>
<td>Op. time</td>
<td>Displays actual number of days of operation</td>
<td>0 - * days</td>
</tr>
<tr>
<td></td>
<td>Op. time</td>
<td>Displays actual number of minutes of operation</td>
<td>0 - * minutes</td>
</tr>
<tr>
<td></td>
<td>I out</td>
<td>Displays actual output current</td>
<td>0 - * A</td>
</tr>
<tr>
<td></td>
<td>V in RMS</td>
<td>Displays actual input voltage</td>
<td>0 - * V</td>
</tr>
<tr>
<td></td>
<td>Temp</td>
<td>Displays actual temperature inside frequency converter</td>
<td>0 - * °C</td>
</tr>
<tr>
<td></td>
<td>FIRE</td>
<td>Activate fire mode. &quot;Fire&quot; from the hand terminal or external input has higher priority than &quot;Normal&quot;.</td>
<td>&quot;1&quot; = Fire &quot;0&quot; = Normal</td>
</tr>
<tr>
<td></td>
<td>Exit</td>
<td>Return to main menu</td>
<td></td>
</tr>
<tr>
<td>Setup</td>
<td>Control</td>
<td>Choice of control signal</td>
<td>Modbus***/0-10 V DC</td>
</tr>
<tr>
<td></td>
<td>Rotation</td>
<td>Setting rotation direction</td>
<td>&quot;1&quot; = CW &quot;0&quot; = CCW</td>
</tr>
<tr>
<td></td>
<td>Min. rpm</td>
<td>Setting minimum revolutions (fig. 7)</td>
<td>PM: 0 - * rpm</td>
</tr>
<tr>
<td></td>
<td>Max. rpm</td>
<td>Setting maximum revolutions (fig. 7)</td>
<td>PM: 0 - * rpm</td>
</tr>
<tr>
<td></td>
<td>Up Ramp</td>
<td>Setting ramp-up time (fig. 6)</td>
<td>0 - * s</td>
</tr>
<tr>
<td></td>
<td>Down Ramp</td>
<td>Setting ramp-down time (fig. 6)</td>
<td>0 - * s</td>
</tr>
<tr>
<td></td>
<td>Switch Hz</td>
<td>Setting output switching frequency</td>
<td>Auto, Low, High</td>
</tr>
<tr>
<td></td>
<td>Exit</td>
<td>Return to main menu</td>
<td></td>
</tr>
</tbody>
</table>

*** In versions of HTERM-SW older than 1.02, the word "HTERM" may be used instead of "Modbus" as an option for the "Control" setting.
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<tr>
<th>Main Menu</th>
<th>Settings</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm</td>
<td>Reset Alarm</td>
<td>Activated to reset alarm when maximum number of restarts has been exceeded.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Alarm stop</td>
<td>Displayed in case of motor stop due to alarm.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Voltage low</td>
<td>Displayed in case of alarm due to insufficient mains voltage.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Voltage high</td>
<td>Displayed in case of alarm due to excessive mains voltage.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Phase error</td>
<td>Displayed in case of alarm due to one or more lacking phases in power supply.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Current high</td>
<td>Displayed in case of alarm due to excessive output current.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Current limiting</td>
<td>Displayed in case of active current limitation alarm (e.g. in the event of insufficient ramp time or overloaded motor).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>V ripple</td>
<td>Displayed in case of alarm due to unstable mains voltage.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Temperature high</td>
<td>Displayed in case of alarm due to excessive temperature in frequency converter.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rotor blocked</td>
<td>Displayed in case of rotor blockage.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rotation direction</td>
<td>Displayed in case of wrong rotation direction.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Internal communication error</td>
<td>Displayed in case of internal communication error.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Internal HW fault</td>
<td>Displayed in case of an internal hardware error.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EEPROM error</td>
<td>Displayed in case of an error in the internal memory (EEPROM).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Motor phase error</td>
<td>Displayed in case of a phase error on the motor side (U, V, W).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Brake chopper fault</td>
<td>Displayed in case of a brake chopper error.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ext. 24V overload</td>
<td>Displayed in case of overload on the external 24V supply.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exit</td>
<td>Return to main menu</td>
<td></td>
</tr>
<tr>
<td>Modbus</td>
<td>Address</td>
<td>Setting and displaying Modbus address</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Baud rate</td>
<td>Setting and displaying baud rate 9600, 19200, 38400, 115200 bps</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Parity</td>
<td>Setting and displaying parity None Odd Even</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stop bits</td>
<td>Setting and displaying stop bits 1 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Timeout</td>
<td>Communication timeout 0 - 200 s</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exit</td>
<td>Return to main menu</td>
<td></td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Main Menu</th>
<th>Settings</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>About</td>
<td>Modbus addr</td>
<td>Displays the frequency converter Modbus address</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Drives type</td>
<td>Displays the frequency converter type</td>
<td>1000- ?*</td>
</tr>
<tr>
<td></td>
<td>MOC SW ver</td>
<td>Displays the frequency converter MOC software version</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MOC Boot ver</td>
<td>Displays the frequency converter MOC bootloader version</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ADC SW ver</td>
<td>Displays the frequency converter ADC software version</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ADC Boot ver</td>
<td>Displays the frequency converter ADC bootloader version</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IO SW ver</td>
<td>Displays I/O module software version</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HW Cfg var</td>
<td>Display Hardware configuration variant</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HW Cfg ver</td>
<td>Display version of the Hardware configuration version</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Motor Cfg var</td>
<td>Displays motor configuration variant</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Motor Cfg ver</td>
<td>Displays version of the motor configuration version</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fan Cfg var</td>
<td>Displays fan configuration variant</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fan Cfg ver</td>
<td>Displays version of the fan configuration version</td>
<td></td>
</tr>
<tr>
<td></td>
<td>User Cfg var</td>
<td>Displays user data variant</td>
<td></td>
</tr>
<tr>
<td></td>
<td>User Cfg ver</td>
<td>Displays version of the user data version</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hterm SW ver</td>
<td>Displays Frequency converters hand terminal software version</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exit</td>
<td>Return to main menu</td>
<td></td>
</tr>
<tr>
<td>Config</td>
<td>Drive configuration</td>
<td>Enter PIN code for access</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Please contact FläktGroup</td>
<td></td>
</tr>
</tbody>
</table>

* = Depends on the size of the frequency converter concerned.

SERVICE AND MAINTENANCE
No special maintenance is required. Please contact your supplier if you experience problems with the product.

DISPOSAL AND ENVIRONMENTAL PROTECTION
Help protect the environment by disposing of the packaging and redundant products in an environmentally responsible manner.

Troubleshooting

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>No values/light in hand terminal</td>
<td>Frequency converter is switched off</td>
<td>Switch frequency converter on</td>
</tr>
<tr>
<td></td>
<td>Defective Modbus cable</td>
<td>Replace Modbus cable</td>
</tr>
<tr>
<td></td>
<td>RJ12 connector incorrectly fitted</td>
<td>Check connection at both ends</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Insert RJ12 connector into port &quot;A&quot; on the frequency converter</td>
</tr>
</tbody>
</table>

PRODUCT DISPOSAL
Products marked with this symbol must not be disposed of along with household refuse but must be delivered to a waste collection centre in accordance with current local regulations.

Specifications are subject to alteration without notice.
FLÄKTGROUP BUILT-ON FREQUENCY CONVERTER

TROUBLESHOOTING

- Before opening the frequency converter, the mains voltage must be disconnected for at least 3 minutes to ensure there is no risk of dangerous residual currents in electronic circuits or capacitors.
- If natural draught through the duct system cause the fan to rotate even though it has received no operating signal, there is a risk that the motor will induce voltage on the frequency converter motor terminals, making them dangerous to touch.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor inoperative</td>
<td>Lacking supply voltage</td>
<td>Check voltage 400V in frequency converter terminals L1, L2 and L3. Check whether short-circuit protection has been activated. Check that the voltage supply to frequency converter has not been cut off by other components.</td>
</tr>
<tr>
<td>Poor electrical connections</td>
<td></td>
<td>Check electrical connections</td>
</tr>
<tr>
<td>Wrong motor for frequency converter</td>
<td></td>
<td>Check that the correct motor settings have been read into and stored in the frequency converter setup.</td>
</tr>
<tr>
<td>Lacking operating signal</td>
<td>A/D control: Short-circuit frequency converter terminals Din 1 (START) and GND</td>
<td></td>
</tr>
<tr>
<td>No 0-10 V DC control signal</td>
<td></td>
<td>Check that 0-10 VDC signal is connected correctly to frequency converter terminals +10V dc, 0-10V In and GND. With potentiometer control: Check that the potentiometer is connected correctly to frequency converter terminals +10V dc, 0-10V In and GND.</td>
</tr>
<tr>
<td>Active alarm</td>
<td></td>
<td>Read out active alarms and remedy their cause.</td>
</tr>
<tr>
<td>The motor has been stopped by the built-in motor protector 5 times because of overload or other alarm.</td>
<td></td>
<td>Reset the alarm by short-circuiting frequency converter terminals Din 2 and GND. The alarm can also be reset by disconnecting the power supply to the frequency converter and reconnecting it after approx. 60 seconds.</td>
</tr>
<tr>
<td>Defective frequency converter</td>
<td></td>
<td>Replace frequency converter. Never attempt to repair a defective frequency converter. Contact your supplier for replacement/repair.</td>
</tr>
<tr>
<td>Defective motor</td>
<td></td>
<td>Replace motor</td>
</tr>
<tr>
<td>Motor running in wrong direction</td>
<td>Wrong phase sequence in motor cable</td>
<td>Interchange two phase wires on the motor or the frequency converter terminal strip.</td>
</tr>
<tr>
<td>Motor is noisier than acceptable</td>
<td>Switching frequency too low</td>
<td>Increase switching frequency 0 = Auto (factory setting), 1 = Low = 4 kHz, 2 = High = 8 kHz. Raising the switching frequency increases energy losses in frequency converter. Switching frequency can be changed using the Hand Terminal.</td>
</tr>
<tr>
<td>Frequency controller cuts out due to an alarm.</td>
<td>At least one alarm active</td>
<td>Use Hand Terminal to view the alarm and determine which alarm has stopped the controller/motor. Reset the alarm by short-circuiting frequency converter terminals Din 2 and GND. The alarm can also be reset by disconnecting the power supply to the frequency converter and reconnecting it after approx. 60 seconds.</td>
</tr>
<tr>
<td></td>
<td>The alarm is re-activated after reset</td>
<td>Use Hand Terminal or PC Tool to view the alarm and determine which alarm has stopped the controller/motor. Remedy the cause of repeated alarm activation.</td>
</tr>
</tbody>
</table>
## FLÄKTGROUP BUILT-ON FREQUENCY CONVERTER

### Troubleshooting when frequency converter is controlled via A/D signals:

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor inoperative</td>
<td>Lacking supply voltage</td>
<td>Check voltage 400V in frequency converter terminals L1, L2 and L3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check whether short-circuit protection has been activated.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check that the voltage supply to frequency converter has not been cut off by other components.</td>
</tr>
<tr>
<td>Poor electrical connections</td>
<td></td>
<td>Check electrical connections</td>
</tr>
<tr>
<td>Wrong motor for frequency converter</td>
<td></td>
<td>Check that the correct motor settings have been read into and stored in the frequency converter setup.</td>
</tr>
<tr>
<td>Lacking operating signal</td>
<td></td>
<td>Check that frequency converter can receive an operating signal.</td>
</tr>
<tr>
<td>Lacking % control signal from Modbus controller</td>
<td></td>
<td>Check the Modbus control signal at Modbus address: Hold registers; Register 3X0001: PrcSet 0-10000 (0-100 %).</td>
</tr>
<tr>
<td>The motor has been stopped by the built-in motor protector 5 times because of overload or other alarm.</td>
<td>Reset alarm: Coil Stat Bits Register 0X0002: Reset (1 pulse = Reset). The alarm can also be reset by disconnecting the power supply to the frequency converter and reconnecting it after approx. 60 seconds.</td>
<td></td>
</tr>
<tr>
<td>The motor has been stopped by the built-in motor protector 5 times because of overload or other alarm.</td>
<td>Replace frequency converter. Never attempt to repair a defective frequency converter. Contact your supplier for replacement/repair.</td>
<td></td>
</tr>
<tr>
<td>Defective frequency converter</td>
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<td>Replace motor</td>
<td></td>
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</tr>
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<td>Switching frequency too low</td>
<td>Increase switching frequency.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 = Auto</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 = Low = 4 kHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 = High = 8 kHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increasing switching frequency increases losses within frequency converter, thus reducing efficiency. Frequency converter switching frequency can be changed via Hand Terminal or via Modbus.</td>
</tr>
<tr>
<td>Frequency controller cuts out due to an alarm</td>
<td>At least one alarm active</td>
<td>Use Hand Terminal to view the alarm and determine which alarm has stopped the controller/motor.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reset the alarm by short-circuiting frequency converter terminals Din 2 and GND. The alarm can also be reset by disconnecting the power supply to the frequency converter and reconnecting it after approx. 60 seconds.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The alarm is re-activated after reset</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Read out the alarm via Modbus registers and determine which alarm has stopped the controller/motor.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Remedy the cause of repeated alarm activation.</td>
</tr>
</tbody>
</table>
## FLÄKTGROUP BUILT-ON FREQUENCY CONVERTER

### Technical specification

<table>
<thead>
<tr>
<th></th>
<th>kW</th>
<th>1,5</th>
<th>2,4</th>
<th>3,0</th>
<th>4,0</th>
<th>5,5</th>
<th>6,5</th>
<th>7,5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power size</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Efficiency</strong></td>
<td>%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Power supply</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Voltage</strong></td>
<td>VAC</td>
<td>3 x 400 VAC 50/60 Hz +/-10%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Supply current at max. load</strong></td>
<td>A</td>
<td>3,1</td>
<td>5,0</td>
<td>6,3</td>
<td>8,4</td>
<td>11,5</td>
<td>13,6</td>
<td>15,7</td>
</tr>
<tr>
<td><strong>Power factor (cos-phi φ) at max. load</strong></td>
<td></td>
<td>&gt; 0,9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Motor output</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Max. output voltage</strong></td>
<td>Vrms</td>
<td>3 x 0 - 360 VAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Max. output current</strong></td>
<td>Arms</td>
<td>4,5</td>
<td>6,4</td>
<td>8,0</td>
<td>11,7</td>
<td>16</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td><strong>Protection</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Max. fuse</strong></td>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>16</td>
</tr>
<tr>
<td><strong>Motor output</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Short-circuit protected between phases</td>
</tr>
<tr>
<td><strong>Motor</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Protected by current limit</td>
</tr>
<tr>
<td><strong>Impulse protection</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Protected against transient voltages by VDR</td>
</tr>
<tr>
<td><strong>Over-voltage protection</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes, 565 V</td>
</tr>
<tr>
<td><strong>Overload protection</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Current and temperature overload protection</td>
</tr>
<tr>
<td><strong>Environment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Operating temperature</strong></td>
<td>°C</td>
<td>-40°C to +50°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Starting temperature</strong></td>
<td>°C</td>
<td>-40°C to +50°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Storage temperature</strong></td>
<td>°C</td>
<td>-40°C to +70°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>mm</td>
<td>185 x 250 x 100 mm</td>
<td>220 x 295 x 110 mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Protection rating</strong></td>
<td>IP</td>
<td>65</td>
<td>54</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Enclosure material</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Aluminium</td>
</tr>
<tr>
<td><strong>Front cover</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Plastic</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>kG</td>
<td>3</td>
<td>3,9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Humidity</strong></td>
<td>% rh</td>
<td>10-95% rh, non-condensing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Vibration</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Stationary: IEC 60721-3-3 Class 3M6 20.0 Kg</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Non-stationary: IEC 60721-3-3 Class 3M6 25.0 Kg</td>
</tr>
<tr>
<td><strong>Air flow / cooling</strong></td>
<td></td>
<td>&gt; 3 m/s</td>
<td>full power</td>
<td>mounted inside air stream</td>
<td>no need for on-board fan &lt; 3 m/s</td>
<td>derated output power</td>
<td>typically mounted outside direct air stream</td>
<td>on-board fan can be added</td>
</tr>
</tbody>
</table>

Specifications are subject to alteration without notice.
# FLÄKTGROUP BUILT-ON FREQUENCY CONVERTER

## Interfaces

<table>
<thead>
<tr>
<th>Digital communication</th>
<th>MODBUS RTU RS485 (baud rate: 9.6, 19.2, 38.4, 115.2 Kbaud)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital communication</td>
<td>Slave</td>
</tr>
<tr>
<td>Digital communication</td>
<td>Master</td>
</tr>
<tr>
<td>Analogue In1 0-10 VDC,</td>
<td></td>
</tr>
<tr>
<td>Analogue Out1</td>
<td>+10 VDC</td>
</tr>
<tr>
<td>Digital In1</td>
<td>Start/stop with internal pull-up</td>
</tr>
<tr>
<td>Digital In2</td>
<td>Alarm res</td>
</tr>
<tr>
<td>Digital Out1</td>
<td>Alarm signal</td>
</tr>
<tr>
<td>Relay 1</td>
<td>Alarm signal</td>
</tr>
<tr>
<td>Relay 2</td>
<td>Running indication</td>
</tr>
<tr>
<td>Green LED</td>
<td>Lit: Power connected</td>
</tr>
<tr>
<td>Red LED</td>
<td>Flashing: Alarm but still running</td>
</tr>
</tbody>
</table>

## Features

<table>
<thead>
<tr>
<th>Technology</th>
<th>Sinusoidal back-EMF signal controlled via FOC (Field Oriented Control)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flying start</td>
<td>Yes, typically below 30% of max. speed depending on load and fan weight</td>
</tr>
<tr>
<td>Ramp-up time</td>
<td>sec.</td>
</tr>
<tr>
<td>Ramp-down time</td>
<td>sec.</td>
</tr>
<tr>
<td>Alarm</td>
<td>Yes</td>
</tr>
<tr>
<td>Alarm reset</td>
<td>Via digital input, Modbus or powering down for more than 60 seconds</td>
</tr>
<tr>
<td>Fan stop</td>
<td>sec.</td>
</tr>
<tr>
<td>Service data log</td>
<td>Operating hours, alarms, loads, software version, max. temp., max. motor voltage,</td>
</tr>
</tbody>
</table>

| max. motor current, max. ripple voltage, max. ripple current | Alarm signal |
| Software updating | Yes, via serial interface |
| Motor parameters | Preprogrammed by FläktGroup or on-site configuration |
| Fire mode | Nominal power for 1 hour at 70°C ambient temperature |
| Field weakening | Yes |
| Short-circuit protection | Yes |
| EMC filter | Integrated |

## Approvals

| EMC | EMC EN 61800-3 (C1 and C2) |
| Safety | EN 61800-5-1 |
| Product standard | EN 61800 Part 2 |
| RoHS Directive | Yes |
| Product approvals | CE |

*Data are valid at: nominal supply voltage, +25°C, sufficient air flow*
FLÄKTGROUP BUILT-ON FREQUENCY CONVERTER

MAINTENANCE

• Frequency converter is maintenance free under normal operating conditions and load profiles.
• The cooling fins must be kept free of dust, dirt and other foreign matter so that air can pass freely over them. Deposits of dust, dirt or other foreign matter on and between the cooling fins will prevent cooling of the frequency converter and thus impair performance.
• The cooling fins may become very hot. (Max. +95°C under normal operating conditions)
• Frequency converter cannot be repaired on site. Never attempt to repair a defective unit. Contact your supplier to obtain a replacement.
• Additional technical data are available on request from Fläkt Woods.

DISPOSAL

Frequency converter contains electronic components and must not be disposed of together with household waste.

• Frequency converter must be disposed of in accordance with applicable local rules and regulations.
• Frequency converter meets the requirements on marking of electronic waste contained in the European WEEE Directive 2012/19/EU.